

NON-PUBLIC?: N  
ACCESSION #: 8806100167  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Callaway Plant Unit 1 PAGE: 1 of 6

DOCKET NUMBER: 05000483

TITLE: Reactor Trip on Shorted Jumper During Turbine Testing and Low Steam  
Line Pressure Safety Injection Due to Inadequately Monitored RCS  
Temperature

EVENT DATE: 02/13/88 LER #: 88-004-01 REPORT DATE: 05/31/88

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
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SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On 2/13/88 at 0355 CST, a reactor trip occurred during turbine surveillance testing. The mechanical trip piston had failed to reset. Per procedure, a jumper was installed in the Electro-Hydraulic Controls cabinet to allow resetting the turbine test circuit and completing the test. The clip of the jumper slipped loose, shorting the circuit to ground, causing the turbine/reactor trip. By design, a Feedwater Isolation and Auxiliary Feedwater actuation occurred following the RPS reactor trip.

Following the trip, licensed operators implemented the correct emergency procedures. Reactor Coolant System (RCS) temperature continued to decrease due to excessive steam loads. The operators were not continuously cognizant of the decreasing RCS temperature. At 0522, steam pressure decreased to 615 psig and a Safety Injection (SI) and Main Steam Line Isolation (MSLI) was actuated. An Unusual Event was declared at 0532. The operators recovered via plant procedures and the Unusual Event was terminated at 0645.

A bypass switch was installed to preclude future jumper use. Operation's personnel were reminded that constant attention to RCS temperature is imperative. As interim guidance, a night order was issued directing operators to shut MSLI Valves in the event RCS temperature falls below 530 degrees F.

(End of Abstract)

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#### Basis for Reportability

On 2/13/88 at 0355 CST, a Reactor Protection System (RPS)(1) reactor trip occurred during a weekly surveillance test of the turbine.(2) A Feedwater Isolation and Auxiliary Feedwater actuation followed the reactor trip. At 0522, an Engineered Safety Features (ESF)(3) Safety Injection (SI) and Main Steam Line Isolation (MSLI) actuated on low steamline pressure due to the cooldown caused by excessive steam loads following the reactor trip.

This report is submitted pursuant to 10CFR50.73(a)(2)(iv) to report the automatic actuations of the RPS and ESF.

#### Conditions at Time of Event

Event 1 - Reactor Trip

Mode 1 - Power Operations

Reactor Power - 100%

Reactor Coolant System (RCS)(4) - temperature (average) - 588.5 degrees F  
pressure - 2231 psig

Event 2 - Safety Injection

Mode 3 - Hot Standby

RCS - temperature (average) - 495 degrees F

RCS - pressure - 2231 psig

Steam Generator(5) - pressure 615 psig

#### Description of Events

##### Event 1:

On 2/13/88, while performing the normal weekly turbine surveillance OSP-AC-00004 'Main Turbine Trip Tests', the Mechanical Trip Piston portion of the test failed to reset as required. For a Mechanical Trip reset failure, the procedure required installation of a jumper in the Electro-hydraulic Controls (EHC)(6) cabinets to allow resetting the mechanical trip and completing the procedure. The jumper was installed per procedure, but the clip of the jumper slipped loose, shorting the 115VAC circuit to ground. This resulted in power being lost to the Mechanical Lockout Solenoid Valve (MLSV)(7). The MLSV returned to its normal, de-energized position. Since the mechanical trip was not reset, this resulted in a turbine trip. With power greater than 50%, the P-9 interlock caused a reactor trip at 0355. By

design, a Feedwater Isolation and Auxiliary Feedwater actuation occurred following the RPS reactor trip.

The licensed utility operators entered the appropriate emergency procedures. These procedures were completed by approximately 0420. Pressurizer level and pressure were stable with Auxiliary Feedwater (AFW)(8) flow returning steam generator levels to the normal operating band.

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#### Event 2:

During restoration from the trip, licensed utility operators properly followed plant emergency procedures E-0 "Reactor Trip or Safety Injection", and ES-0.1 "Reactor Trip Response". RCS temperature was trending down to 557 degrees F when ES-0.1 was entered. Approximately 25 minutes later, a subsequent ES-0.1 step required the reverification of RCS temperature to be 557 degrees F but did not require action or provide guidance if temperature was below 557 degrees. The actual RCS temperature was approximately 550 degrees F and slowly decreasing. The operators continued to the next step in the procedure (verify natural circulation). Upon completion of the final step in the procedure, they entered the appropriate operating procedure as directed by the emergency procedure.

The operators entered the normal operating procedure (OTG-ZZ-00005) that took the plant from 20% power to a hot standby condition. This procedure called for opening steam drains and removing various equipment from service as a part of the normal turbine/reactor plant shutdown. RCS temperature continued to decrease due to the secondary steam loads. These steam loads included:

#### (A) Excessive Steam Seal System Flow

As a result of the trip, it was necessary to place gland seal steam loads on the main steam system. The main steam seal automatic pressure regulator valve(9) malfunctioned as indicated by zero psig on the gland seal pressure indicator. The licensed reactor operator manually bypassed this valve from the main control board. This resulted in a pressure transient which led to excessive steam flow through the steam seal system.

#### (B) Steam Flow Through Open Main Steam Line Drains(10) to the Main Condenser(11)

The main steam line drains had been opened per OTG-ZZ-00005.

RCS temperature had decreased to approximately 495 degrees F resulting in

corresponding lower S/G temperatures and lower steam pressures. At 0522, the steam line pressure reached its low setpoint (615 psig) and an SI and a MSLI resulted.

In response to the MSLI, the main steam isolation valves (MSIV)(12) shut. RCS temperature immediately began to return to 557 degrees F due to the isolation of the steam loads.

The utility licensed operators performed the appropriate emergency procedures and declared an Unusual Event at 0532 as required by the emergency plan. The plant was restored to a normal condition and the Unusual Event was terminated at 0645.

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#### Root Cause

##### Event 1:

The cause of the turbine test failure (Mechanical Trip failed to reset) has not been determined. Extensive post trip testing and evaluation indicated an intermittent failure of the mechanical trip linkage to reset. A suspected cause was determined to be excessive free play in the linkage. This cannot be confirmed without a major disassembly of the main turbine front standard which is scheduled for the next refueling outage. This condition does not prevent the mechanical overspeed trip from performing its intended function.

The jumper used in the procedure slipped from a terminal in the EHC cabinet. The location and design of the terminal block(13) did not provide an easily accessible location at which to place the jumper. Human factors were not adequately addressed during development of the surveillance test procedure steps that addressed the use of this jumper.

##### Event 2:

The utility licensed operators were not continuously cognizant of RCS temperature and consequently did not take effective action to stop the decreasing RCS temperature caused by the excessive steam loads described above.

A contributing factor was the lack of guidance in the emergency procedure ES-0.1 (e.g., no action was specified when RCS temperature fell below 557 degrees F).

## Corrective Actions and Actions to Prevent Recurrence

### Event 1:

(a) A complete disassembly and inspection of the mechanical trip linkage is scheduled for Refuel III. Reviews of experience at similar units and discussions with the turbine vendor, General Electric, have not indicated a generic failure trend involving similar failures.

(b) A bypass switch was installed so that use of a jumper in the EHC cabinet will not be required if the Mechanical Trip fails to reset in the future.

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### Event 2:

(a) The controller for the main steam seal automatic pressure regulator valve was re-adjusted.

(b) Operations personnel were reminded that constant attention to certain key parameters (RCS pressure, RCS temperature, RCS flow and Reactor Power) is imperative. Progressive discipline has been initiated for those personnel involved.

(c) As interim guidance, a night order was issued directing licensed operators to shut MSIV's in the event RCS temperature falls below 530 degrees F following a reactor trip.

(d) Emergency procedure ES-0.1 was changed to caution operators to the consequences of low RCS temperatures.

### Safety Significance

The RPS and ESF systems performed as designed following these events. There was no radiological release to the environment. There was no adverse affect on the public health and safety.

### Previous Occurrences

LER 85-019-00; ULNRC-1084 dated 4/29/85

LER 86-027-00; ULNRC-1363 dated 8/25/86

LER 85-019-00 detailed an SI on a low Steamline Pressure signal. Since the SI described was actuated on a rate sensitive decline in steam pressure

(during a planned RCS cooldown), and not by an actual low steamline pressure, the root cause is not the same as the current event.

LER 86-027-00 described a turbine/reactor trip caused by the mechanical overspeed turbine trip (MOTT) reset signal initiating before the MOTT latching mechanism was physically reset. A jumper switch was installed to maintain the MLSV energized when required during testing. During April-May 1987, time delay relays were added to ensure a MOTT reset signal was not generated before the trip latching mechanism was reset. The jumper switch was removed at that time. Due to the need to troubleshoot test circuit failures which could involve failure of these time delay relays, the provision to use the jumper which is addressed in this LER was subsequently added to procedure OSP-AC-00004. LER 86-027-00 therefore had a different root cause and corrective action on that problem and could not have been expected to prevent the current event.

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#### Footnotes

The system and component codes listed below are from IEEE Standards 805-1983 and 803A-1983, respectively.

- (1) System - JC
- (2) System - TA
- (3) System - JE
- (4) System - AB
- (5) System - AB, Component - SG
- (6) System - JJ, Component - CAB
- (7) System - JJ, Component - CSV
- (8) System - BA
- (9) System - TC, Component - PMC
- (10) System - SB, Component - DRN
- (11) System - SG
- (12) System - SB, Component - ISV
- (13) System - JJ, Component - BLK

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Callaway Plant May 31, 1988

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ULNRC-1781

Gentlemen:

DOCKET NUMBER 50-483  
CALLAWAY PLANT UNIT 1  
FACILITY OPERATING LICENSE NPF-30  
LICENSEE EVENT REPORT 88-004-01  
REACTOR TRIP ON SHORTED JUMPER DURING  
TURBINE TESTING AND LOW STEAM LINE PRESSURE SAFETY  
INJECTION DUE TO INADEQUATELY MONITORED RCS TEMPERATURE

The enclosed Licensee Event Report is submitted to revise  
information provided in LER 88-004-00 transmitted via ULNRC-1742, dated  
March 14, 1988.

/s/J. D. Blosser  
J. D. Blosser  
Manager, Callaway Plant

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